REMARKS

Claims 1, 2, and 21-35 are pending in the Subject Application. Claims 3-20 were previously canceled. Claims 1, 2, 23 and 24 are amended and claim 27 is canceled. New claims 36-38 are added.

Applicants submit herewith the Declaration of John Paules for the Examiner's consideration to demonstrate that several of the assumptions made are not supported by the knowledge in the art.

Rejections Under 35 U.S.C. §103(a)

The Examiner rejected claims 1, 2, 23, 24 and 27-35 under 35 U.S.C. §103(a) as being unpatentable over any one of Hill, U.S. Patent Re 28,523, Anthony, U.S. Patent No. 3,068,095 or Gondo, U.S. Patent No. 3,574,602.

The Examiner rejected claims 21, 22, 25 and 26 under 35 U.S.C. §103(a) as being unpatentable over any one of Hill, Anthony or Gondo in view of Lyon, U.S. Patent No. 2,942,339.

Hill (U.S. Patent Re 28,523)

As stated in the Specification of the Subject Application, Applicants were charged with the task of developing an alloy to replace expensively alloyed steels with an alloy that could be produced at a lower cost without sacrificing the desired properties. Hill is representative of the expensively alloyed steels whose properties Applicants sought to reproduce, but whose constituents Applicants sought to change. The Examiner points to the disclosure at col. 2, lines 1-24 of the Hill patent, and in particular the ranges of weight percents listed in the Table at col. 2 for the elements and amounts of the Hill composition.

Applicants submit that the Examiner is reading the information provided in the Table in col. 2 in isolation, apart from the entirety of the teachings of the Hill patent. At col. 1, lines 54-58, Hill states that "cobalt and nickel are *essential* constituents in small to moderate amounts of

about 3-12% nickel and 0.2-7% cobalt together with carbon in the range of 0.1-0.65%." (emphasis added). While Hill later states that the nickel can be replaced by copper up to about one-third of the nickel content that would otherwise be used, on a 1:1 percentage basis, there is no indication that cobalt can be replaced. Thus, Hill teaches that cobalt is an essential constituent of the disclosed composition. The Examiner states that Hill teaches how to adjust the carbon and cobalt contents to obtain the claimed tensile strength. While the cobalt content can be adjusted, it isn't taught that it can be eliminated. To the contrary, cobalt is essential.

The Examiner is correct that Hill teaches the manner in which carbon can be adjusted and how other elements should be adjusted with variations in the carbon content. In col. 2, lines 30-33, Hill states that for "carbon contents below about 0.3%, the steel should preferably contain below about 0.5-1.5% each of chromium and molybdenum". For higher carbon contents, Hill teaches that chromium and molybdenum should be lowered, to 0.25-0.5%. At col. 10, lines 11-15, Hill reiterates the desired range of chromium for low carbon compositions. In the next paragraph in col. 10, Hill states that some of the chromium can be replaced by tungsten on an equivalency basis of three parts by weight of tungsten for each part by weight of chromium. According to the teachings of Hill, the disclosed composition must include at least 0.2% cobalt up to 7 % cobalt, and for a low carbon steel, such as one having less than 0.30% carbon, there should be 0.5-1.5% chromium or 1.5-4.5% tungsten or some combination wherein tungsten replaces chromium in a 3:1 by weight basis (it is not clear whether the 3:1 replacement includes the 0.0-0.75% tungsten listed in the Table at col. 2 or is in addition to it). Applicants' alloy, as recited in claim 1, consists of, in weight percentages, 0.16% to about 0.35% carbon, 1.5-3.25% chromium and 1.17-3.25% tungsten and no intentionally added cobalt. If any cobalt is present, it would be present as an impurity. The cobalt in the Hill composition is clearly intentionally added at levels far in excess of any impurity. The amount of chromium in applicants' alloy is greater than that taught by Hill as suited for low carbon steels and tungsten is present in addition to the higher levels of chromium, not as a replacement for it. Molybdenum in Applicant's alloy is consistent with the lower levels that Hill teaches to be suited to high carbon content steels; which is the opposite of the relative amounts of carbon and molybdenum in Applicant's claimed alloy. Further, the tungsten in the claimed alloy is present in lower levels than would be present according to the teachings of Hill if it replaced chromium in a 3:1 ratio (a minimum of 4.5%

tungsten would be needed to replace the low end point of 1.5% chromium) and is present in higher amounts than taught by Hill if it is not used to replace chromium.

While some of the elements overlap and the top of a range of chromium and tungsten for low carbon steels in Hill's composition may be the bottom of the range for those elements in the claimed alloy, the overall combination of elements in the amounts claimed in Applicants' alloy is very different from the overall combination of elements in the amounts taught by Hill. Hill clearly does not contemplate an alloy having no intentionally added cobalt in combination with a low carbon alloy having the relatively higher levels of chromium and tungsten taught in the Subject Application.

The transition phrase "consisting of" according to MPEP 2111.03 "excludes any element ... not specified in the claim" except impurities ordinarily associated therewith (quoting *Ex parte Davis*, 80 USPQ 448, 450 (Bd. App. 1948), or as stated by the Court of Appeals for the Federal Circuit, something "unrelated to the claimed invention" (quoting *Norian Corp. v. Stryker Corp.*, 363 F.3d 1321, 1331-32 (Fed. Cir. 2004).

Claim 1 has been amended to recite an alloy steel in weight percentage *consisting of* the recited elements and ranges and further that the claimed alloy has a ductility as measured by high rate strain to failure of about 15.1% to about 16.6%. Claim 2 has been similarly amended to recite an alloy steel *consisting of* the recited elements and amounts, including about 0.28% carbon, about 1.03% nickel, about 2.75% chromium, about 1.17% tungsten and about 0.1% copper. Thus, cobalt in the amounts taught by Hill to be *essential* is not encompassed within the claimed alloy. The combination of the elements in the respective relative amounts identified in claim 2, for example, is not disclosed by Hill. Nickel is present in much lower amounts than taught by Hill. Chromium is present in higher amounts than taught by Hill. If the chromium is viewed as having been replaced in part by tungsten, there is not enough tungsten recited in claims 2 to satisfy Hill's requirements.

Claims 23 and 24 have been amended to recite an alloy steel in weight percentage *consisting of* the recited elements in the stated amounts, including about 0.28% carbon, about 1.03% nickel, 1.5 to 3.25% chromium and about 1.17% tungsten. The combination of the

elements in the respective relative amounts identified in claims 23 and 24 is not disclosed by Hill. As stated above, cobalt in the amounts taught by Hill to be *essential* is not encompassed within the claimed alloys. Nickel is present in much lower amounts than taught by Hill. The range of chromium claimed is present in higher amounts than taught by Hill. If the chromium is viewed as having been replaced in part by tungsten, there is not enough tungsten recited in claims 23 or 24 to satisfy Hill's requirements.

Claims 28-38 depend from claims 1, 2, 23 or 24 and add limitations concerning properties of the claimed alloy. Claims 28-38 include every limitation of their respective base claims and thus also are not disclosed by the teachings of the Hill patent.

Applicants submit that there is nothing in the Hill patent that would suggest to one skilled in the art or motivate the skilled person to eliminate essential elements, raise the amounts of some elements and lower the amounts of others in a manner completely contrary to the teachings of the Hill patent. There is nothing in the Hill patent that would suggest to a person skilled in the art which of the elements in the combination of elements taught by Hill to eliminate and which to adjust in the manner claimed by Applicants or that by doing so in the manner recited in claims 1, 2, 23, 24 and 28-38, that one could achieve an alloy having properties comparable to those of the Hill composition. The Hill patent in fact, teaches away from Applicants' claimed alloy rather than making the claimed alloy obvious to a person skilled in the art of metallurgy. Withdrawal of the rejection of claims 1, 2, 23, 24 and 28-35 under 35 U.S.C. §103(a) as being unpatentable over the Hill patent is respectfully requested.

Anthony (U.S. Patent No. 3,068,095)

The composition disclosed in the Anthony patent has a carbon range of 0.35-0.47%, which, apart from the low end 0.35% of the range, is higher than applicant's alloy as recited in claim 1 of 0.16-0.35% and well above the carbon content recited in claims 2, 23 and 24. Apart from the top of the range of chromium at 1.5% taught by Anthony meeting the bottom of the range of Applicants' chromium content of 1.5-3.25% recited in claims 1, 23 and 24, Anthony's overall chromium content is lower. Claim 2 recited chromium at about 2.75%, an amount much higher than disclosed by Anthony. Anthony states that cobalt is present at 0.85% to about 1.34%

but may be eliminated when vanadium is above 0.15%. Applicants eliminate intentionally added cobalt regardless of the vanadium content, which in claims 2 is lower than 0.15%. Anthony discloses tungsten as a substitute for molybdenum in a ratio of 2:1. Molybdenum is taught in Anthony as being present at about 0.15% to about 0.40%, so tungsten, if used to replace molybdenum, would be present at 0.3% to about 0.8%. In claims 2, 23 and 24 of the Subject Application, Applicants claim tungsten at 1.17%, much higher than the amount taught by Anthony to replace molybdenum. Moreover, Applicants do not necessarily eliminate molybdenum. In claim 24, some amount of molybdenum is necessarily present.

Anthony does not include nickel and does not mention nickel. The various embodiments of Anthony's compositions are described as within the recited limits with the balance iron with the usual impurities. This does not suggest inclusion of any elements other than impurities. Claims 2, 23 and 24 of the Subject Application include about 1.03% nickel, an amount clearly above any impurity. Anthony clearly does not contemplate or suggest nickel in such relatively high amounts. Based on the foregoing differences, the alloys taught by Anthony are clearly different from those recited in claims 1, 2, 23 or 24 of the Subject Application.

The Examiner stated that the alloy steel of Anthony would inherently have a Charpy V-notch impact strength of about 20-43 ft-lbs at -40 °F because of Anthony's examples of high strength and ductility and because Anthony teaches substantially the same composition as that claimed. Applicants respectfully disagree. As described above, the overall combination of elements and the amounts of such elements in the compositions taught by Anthony are not the same as the overall combination and amounts of elements in the alloy steels claimed by Applicants. Because they are so different, the compositions disclosed by the Anthony patent would not result in Charpy V-notch impact properties similar to those claimed by Applicants. The assumption is incorrect for several reasons. Because at the high carbon content shown in most examples, the lightly tempered microstructure will have poorer toughness and ductility than Applicants' lower carbon steel. Evidence of this can be seen in Anthony's low Tensile Elongation results of 4.0% to 7.5%. Even the example having 0.35% carbon (col. 3, line 31) has very poor Tensile Elongation results. Applicants' claimed alloy has more than double the ductility (high rate strain to failure %) as shown in Table 3 at page 8 of the specification, *i.e.*,

15.1 for ES-5 to 16.6% for ES-1. The Declaration of John Paules incluides copies of three graphs which demonstrate that as carbon content increases in lightly tempered steels, the ductility (% Elongation) decreases and impact strength (toughness) decreases. Anthony discloses very low % Elongation which corresponds to low toughness. Thus, while a cursory review of the compositions of Anthony may appear to overlap the claimed alloys of the Subject Application, a closer examination of the elements and the relative amounts of each shows that some elements are missing entirely from Anthony while others are present in significantly different amounts, such that properties that one might expect if the compositions were the same are not present in Anthony and not obvious in view of Anthony because the compositions are not in fact the same.

Claim 1 has been amended to recite the Charpy V-notch properties and the ductility properties of the claimed alloy. Claims 2 and 24 also recite the Charpy V-notch values. Claims 2, 23 and 24 recite amounts of nickel not disclosed by the Anthony patent in addition to the differences in the amounts of carbon and tungsten disclosed by the Anthony patent. Claims 28-38 depend from claims 1, 2, 23 or 24 and add limitations concerning properties of the claimed alloy. New claims 36-38 add the ductility properties of Applicants alloy to claims 23 and 24. Claims 28-38 include every limitation of their respective base claims and thus also are not disclosed by the teachings of the Anthony patent.

Applicants submit that there is nothing in the Anthony patent that teaches or suggests the claimed alloys or inherently discloses the claimed properties. Applicants have demonstrated differences between the Anthony patent and the alloy recited in claims 1, 2, 23 and 24. The differences between the compositions disclosed by Anthony and the claimed alloys would not have been obvious to one of ordinary skill in the art. Withdrawal of the rejection of claims 1, 2, 23, 24 and 28-35 under 35 U.S.C. §103(a) as being unpatentable over the Anthony patent is respectfully requested.

Gondo (US Patent 3,574,602)

In his Declaration submitted herewith, John Paules states that the composition disclosed in the Gondo patent is a very lightly alloyed steel and that the only significant alloy addition is

1.5% Cr. The Gondo steel is designed for "delayed rupture" resistance. The Declaration states that although the heat treatment is not specified in the Gondo patent, the tensile strength levels of about 150 kg/mm (1,320 MPa) are significantly lower than those of the alloy disclosed in the Subject Application (1,725 MPa). No Charpy V-notch impact properties or ductility data are provided for the alloy of the Gondo patent, but with the low alloy content and resultant low hardenability, toughness would be expected to be poor in medium and large section sizes. The Gondo patent by its own terms demonstrates that it does not achieve the properties achieved by Applicants' alloys.

As the Examiner pointed out, the Gondo patent requires the addition of at least one of Sn, Sb or As. Applicants' claimed alloy does not include any of those elements. As stated above, the claims have been amended to recite an alloy steel in weight percentage *consisting of* the recited elements and ranges. As stated above, the MPEP provides that this transition term means that the claim excludes any element not specified in the claim except impurities ordinarily associated therewith or something unrelated to the claimed invention. Thus, claims 1, 2, 23 and 24 exclude Sn, Sb and As in anything but impurity levels that would ordinarily be associated with a low carbon steel alloy. In addition, the Gondo composition indicates as optional many of the elements required in the claimed alloys. Tungsten, for example, if present in the Gondo composition would only be present in an amount up to 1.0%. Claims 2, 23 and 24 of the Subject Application state that tungsten is present in an amount of about 1.17%.

While there is some overlap between some elements of the claimed alloy and some of the elements of the composition disclosed in the Gondo patent, there are sufficient differences to have allowed Applicants to produce an alloy with significantly improved properties over those shown to have been obtained with the Gondo compositions. Applicants submit that the composition disclosed by Gondo, as shown, do not render the claimed alloys obvious.

Applicants submit that there is nothing in the Gondo patent that teaches or suggests the claimed alloys or inherently or directly discloses the claimed properties. Applicants have demonstrated differences between the Gondo composition and the alloy recited in claims 1, 2, 23 and 24 of the Subject Application. The differences between the compositions disclosed by Gondo and the claimed alloys would not have been obvious to one of ordinary skill in the art.

Withdrawal of the rejection of claims 1, 2, 23, 24 and 28-35 under 35 U.S.C. §103(a) as being unpatentable over the Gondo patent is respectfully requested.

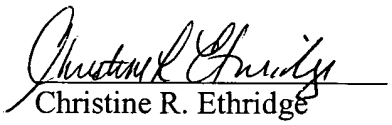
Lyon (U.S. Patent No. 2,942,339)

Based on the differences between the claimed alloys and the teachings of the Hill, Anthony and Gondo patents discussed above, Applicants submit that claims 21, 22, 25 and 26 are not obvious in view of the combination of any of those patents and Lyon. Withdrawal of the rejection of claims 21, 22, 25 and 26 under 35 U.S.C. §103(a) as being unpatentable over any one of Hill, Anthony or Gondo in view of Lyon is respectfully requested.

Conclusion

Applicants have made every effort to advance prosecution of the Subject Application. The claims are believed to be in condition for allowance. Reconsideration and allowance of claims 1, 2, 21 to 26 and 28 to 35 and consideration and allowance of new claims 36-38 are respectfully requested. If the undersigned can be of any assistance to the Examiner in advancing the application to allowance, the Examiner is urged to contact the undersigned attorney at the number set forth below.

Respectfully submitted,



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